FORECASTING EL NIÑO AND LA NIÑA

BY BARBARA STAHURA

So what if there is a temporary rise in the surface temperature of the tropical Pacific Ocean, leading to a shift in the Pacific trade winds? What could possibly happen?

In a word, *disaster*.

When this climate pattern occurred in the winter of 1982-83, famine struck Indonesia, drought-caused bushfires blasted Australia, rainstorms battered California to the tune of $2.2 billion, and the warm ocean devastated Peru's anchovy fishing industry. It is said that, worldwide, 2,000 people died and economic losses exceeded $8 billion.

Nine El Niño events have occurred in the last 40 years, with the 1982-83 and 1997-98 events being the strongest. The term "El Niño" originally referred to a warming of coastal waters in the tropical Pacific that occurs annually beginning in mid- to late-December (near Christmas, hence the term El Niño or "the Child" in Spanish). We now know that the warmer waters quite often result from a weakening and reversal of the region's normal ocean currents.

The term "El Niño" is now used for unusual coastal warmings that are longer and more intense than the annual warming. Research studies in the 1960s revealed that the coastal warming was part of a large-scale warming across much of the equatorial Pacific, associated with large-scale atmospheric circulation (pressure and wind) changes that are related to a phenomenon called the Southern Oscillation. This gave birth to the acronym ENSO, or El Niño/Southern Oscillation, and the concept of the ENSO cycle, which has cold (La Niña) and warm (El Niño) phases.

NOAA is the global leader in forecasting and monitoring this climate pattern. Thanks to decades of research, NOAA's Climate Prediction Center (CPC) can monitor and predict the ENSO cycle. By making its findings available to private organizations and government agencies worldwide, CPC helps them avert or reduce negative impacts and take advantage of positive effects.
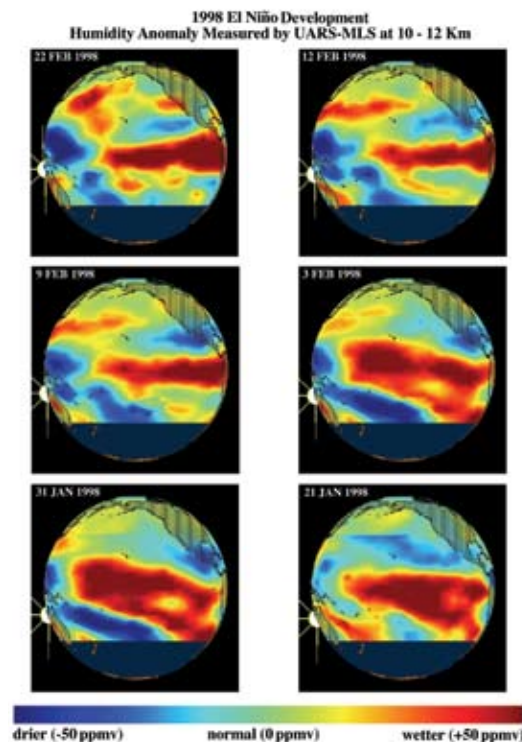
CPC was able to predict the 1997-98 El Niño, one of the strongest events of the last century. Its accurate predictions, six months in advance, of heavy winter rains

These six images, compiled with data obtained by the Microwave Limb Sounder (MLS) on NASA's Upper Atmosphere Research Satellite (UARS) during January and February 1998, show the evolution of atmospheric water vapor over the Pacific Ocean during the 1998 El Niño condition. *Credit: NASA Jet Propulsion Laboratory (NASA-JPL)*

over the southern United States and a mild Midwest winter meant that the most harmful effects were alleviated, while the benefits were used to advantage. For instance, while California still suffered heavy flooding, the advance warning meant that economic losses totaled only half those of 1982-83.

After the unpredicted 1982-83 event, NOAA became a major partner in the international Tropical Ocean Global Atmosphere program designed to improve tropical-ocean monitoring. The ENSO Observing System, which NOAA helped design and continues to maintain, was established then. Its major components: the Voluntary Observing Ship program measures ocean temperatures; the tide gauge network monitors sea-level changes; the drifting buoy network captures ocean currents and surface temperatures; and moored buoys (TAO array) monitor surface winds, relative humidity, air temperature, surface and subsurface ocean temperatures, and ocean currents. Satellites collect data transmitted from the TAO array several times daily.

NOAA's National Centers for Environmental Prediction use computer models and statistical models to help predict ENSO activity. The CPC produces a monthly ENSO discussion and weekly updates (available via the Internet) used by farmers, the media, power utilities, water resource and transportation agencies, insurance companies, various government agencies, and others.

NOAA continues to build upon its leadership and legacy in the detection, prediction, and understanding of ENSO and is improving the ENSO Observing System. Among the new components is the research ship *Ka'imimoana*, dedicated to servicing the TAO array. Further improvements in technology, predictive techniques, and global hazard and benefit assessments will provide the world with a more thorough understanding of ENSO evolution and its impacts. While an El Niño on the scale of 1982-83 and 1997-98 may occur again, thanks to NOAA, the world is better prepared.

NOAA Climate Prediction Center – www.cpc.ncep.noaa.gov